THE RELATION OF SOIL INSECTS TO CLIMATIC CONDITIONS.[1]

The soil responds directly to the meteorological conditions of the air, chief among which are pressure, humidity, and temperature. If those conditions favor the growth of plant life, they are also beneficial to that of the animal organisms which dwell all or a part of the time in the soil. Mr. Cameron states that "according as all climatic conditions allow, entomologists may rather accurately prophesy what genera and sometimes species of insects are likely to exact toll on the cultivated crops of any one district." He further says that a series of favorable weather occurrences, which the agriculturist may have considered quite unimportant, may cause a rapid increase of insect species. Unfavorable conditions may destroy the insects while in the soil, or retard their metamorphoses, though some species may adapt themselves to conditions which were at first unfavorable, especially if the environmental changes be slow. "As a physical index of the varied conditions which control an organism, the evaporating power of the air is supreme to any other." The relation of temperature to growth varies with the type of insect and with the phase of its existence in the soil. Thus humidity and temperature, together with the character of the soil, whether light or heavy, porous or compact, are determining factors. The writer emphasizes the necessity of intensive studies of the correlation between climatic conditions and insect life during hibernation for the purpose of forecasting more accurately the appearance of species which are economically friendly or disastrous to agriculture in the coming season.—*W. E. H.*

WEATHER AND THE OPENING OF COCOONS.

[Reprinted from *Scientific American Monthly*, New York, January, 1921, p. 15.]

The well-known Swiss scientist, M. A. Pictet, has made an extended series of experiments on the effect of the weather upon the opening of cocoons of moths and butterflies. The data discovered and published by him are most interesting and obviously of great significance in agriculture, since hundreds of thousands of the farmer's worst enemies spend a portion of their lives in the cocoon phase. It was found that in most varieties of insects, the emergence of the pupa from the cocoon coincides with the fall of barometer, and that a relative increase of the internal pressure within the cocoon is a necessary factor in the escape of the insect from its prison. When there is an augmentation of the atmospheric pressure during the entire time of this dormant stage of the pupa, or even during the latter half of this period alone, the duration of the dormant stage may be extended from 10 to 20 per cent. Furthermore, when the emergence of the insect is too long retarded, the pupa perishes while still in the cocoon.

A fall of a single millimeter of the mercury in the barometer tube was enough to cause the opening of the sufficiently mature cocoons, while, on the other hand, an increase in the atmospheric pressure was sufficient to postpone the coming forth of such insects for as much as two, three, or even four days until the barometer fell once more.

[1] "The Relation of Soil Insects to Climatic Conditions," by Alfred C. Cameron, M. A. D. Sc. From *The Agricultural Gazette of Canada*, vol. 4, No. 8, August, 1917.

OPEN ROADS ALL WINTER—DEFINITE SNOW REMOVAL PROGRAM IN NORTHERN AND EASTERN STATES.

By M. R. REYNOLDS.

[Excerpts reprinted from *Scientific American*, Feb. 5, 1921, p. 104, 117, 118.]

"* * * Modern highway transportation can not be carried on at convenience and treated with indifference. Railroads do not abandon their shippers when snow drifts block transportation, although it would often be more profitable to stop train service until the rails are cleared by natural agencies. * * *

"Heavy expenditures of money are necessary to keep the main trunk roads open * * * but in sections where the work has been carried on in former winters, its value has been so apparent that [under the general guidance of the Bureau of Public Roads of the United States Department of Agriculture] a concerted effort is being made this winter to keep open the main highways in all the States north of the Potomac and east of the Mississippi open to motor transportation.

* * * * *

"In the past, Pennsylvania has been the leader in snow removal. This winter it is doing more than ever has been attempted in the State before. Seventy-five additional trucks, with snow-plows and correlated mechanical facilities and snow-removal organizations, have been added to its equipment.

"The snow removal problem in Pennsylvania is difficult because of its many mountains and heavy snowfall. By removal of weeds, brush, and obstructions along the roadside in the fall, and by the liberal use of snow fences, the highway commissioners of that State, however, have found it possible to control drifting in such manner that heavy trucks can keep the roads clear with a minimum of assistance in the way of handwork.

"The Pennsylvania Highway Commission also makes use of the Weather Bureau * * * in combating the snow. The Weather Bureau informs the highway department in advance of the approach of storms and this information is sent at once to the field engineers who, with knowledge of the intensity of the coming storm and its probable duration, are more prepared to cope with it than they would be if it came unannounced. As getting on to the job in time and keeping on it until the storm is over are two of the most important factors in fighting a heavy snowfall, this advance information is of utmost importance in all States with a snow removal program.[2] Another admirable detail in the Pennsylvania winter program is the system of daily reports to the public on the condition of the principal highways. These are given both directly and through the Weather Bureau's daily bulletins."

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"It is impossible to estimate what it will cost to keep different highways open for any winter. During the winter of 1919–20, which was the most severe in years in this section of the country [Pennsylvania], the cost ranged from $75 to $350 per mile, while during the year of 1918–19, the cost ranged from $10 to $30 per mile the entire winter."[3]

[2] Further detailed reports are given out by the Weather Bureau during the progress of the storm, and at its close the depth of snow that fell is given for the different sections.—EDITOR.

[3] This quotation is the concluding paragraph of an article on "Snow removal and drift prevention on highways," by G. H. Bil, Assistant Commissioner Pennsylvania Highway Department, Harrisburg Engineering News-Record, Feb. 3, 1921, 86:230-232, 4 photos.